Karoun H. Bagamian: Welcome to the Business of Doing Science podcast, brought to you by Bagamian Scientific Consulting. On this podcast, we discuss different aspects of pursuing science related careers and just how science is actually done beyond the bench. So stay tuned to find out more.

Today we have our first ever science social hour, focusing on a topic that we're really excited about discussing: artificial intelligence, or as we usually hear about it, AI.

We have our usual Business of Doing Science co hosts, which are me, Karoun Bagamian, Lindsey Laytner, and Heidi Bolduc.

We also have Seth Hughes from the Bagamian Sci team who's joining us today.

We welcome back Jesus Martinez Manzo and a new guest and AI expert, Arash Maghsoudi, two very knowledgeable guests for this discussion.

Before we start our discussion, I would love to have our guests tell us a little bit more about themselves. Arash?

Arash Maghsoudi: Hello everyone and thanks for having me here. I'm very happy to be here and I hope that we have a very informative and fun talk together. My name is Arash. I have a PhD in biomedical engineering and right now I'm a machine learning engineer at Baylor College of Medicine for almost two years..

And I'm working with these large language models and GPT models for doing NLP that I'm going to talk about later in the area of healthcare, actually.

Karoun H. Bagamian: Great. Jesus?

Jesus Martinez Manso: Hello everyone. This is Jesus. My background is in astrophysics, but over the last seven or eight years, I've been working in applied machine learning.

So I have been working in the industry as an ML practitioner. I am not doing any kind of research on the bleeding edge stuff that you may have heard of, but I am definitely working with a lot of those tools. So today I work at a company called Planet Labs. It is a company that builds and operates earth imaging satellites.

So we take a lot of images of the earth and we derive analysis from that. So over the last five to seven years, I've been working as a machinery engineer, trying to extract insights from this kind of remote sensing data.

Karoun H. Bagamian: Great. Thank you so much for joining us. This is excellent. So we hear about AI all the time and artificial intelligence.

What is it?

Arash Maghsoudi: Sure. That's a very good question. It's really good to start at the basics and see what we are dealing with. So having a very brief and informative definition of a concept can really help us to grasp the idea.

AI, if I want to be very clear and brief, is a man made system or entity or machine or anything you want to call it, that is trying to mimic the cognitive behavior of the human brain.

So as a human, we have so many qualities, we can do many intelligent things, and in AI, we try to mimic those behaviors in man made machines. For example, we have so many branches of AI. Right now, I'm talking and you're listening, so I'm generating speech and you are actually analyzing my speech. So that gave birth to a branch of AI called Speech Recognition and Speech Synthesis.

We can read and write, and that is Natural Language Processing or NLP in AI. We are all familiar with ChatGPT, you can read what we are writing and you can write many new things, so it's doing that aspect. We can do Scene analysis, we can say if there is a cat in an image or not, if someone is coming toward us or something is running away from us.

We can focus on someone we are talking. And that's the area of computer vision in AI. And we can walk, we can maintain balance, we can walk up the stairs, come down. Sometimes it's slippery, but we can maintain the balance somehow. And that's the robotics in AI. So all of these branches are the childbirth of these cognitive behaviors of our brain.

Jesus Martinez Manso: I would say that that was an excellent description, and I think the question is great because nowadays there's a lot of chatter about AI, ML, other forms of other fields that are similar, and people can get very confused. I think AI in particular has been a term that has been very overused. And assigning the wrong connotation to it. So it's very good to kind of emphasize what Arash just said.

Karoun H. Bagamian: Actually, you know, some of the stuff I've seen on the internet, I've heard that there's different types, like narrow AI and general AI.

Arash Maghsoudi: Yeah, we have these three types of AI. Narrow, which is called artificial narrow intelligence is when the system is doing just one single task.

For example, whenever we look at our iPhone, it does the face recognition and knows it's me. So it just performs one task. That is narrow AI or weak AI. We have made many achievements in that area.

And now we are moving to the second phase, which is the general AI. It is when the system can apply knowledge in different contexts to perform a task.

It can think, it can reason, and it can do the things close to human, like chatbots or like autonomous cars like Tesla machines, things like that, they can drive themselves. So right now we are early in that stage and the next stage is going to be the super AI and we have an AI that can outperform humans in all those tasks that I mentioned.

Karoun H. Bagamian: I'm going to be honest, that's the one that we hear about the most and when people hear about chat, GPT, or some of these tools that you're talking about, I think that we directly go to this image that these tools can do things better than us, or will be able to do things better than us. But in practice right now, it seems like maybe there's still a long way to go.

Is that right?

Arash Maghsoudi: Yeah, it's a beginning of the general AI. There are many prediction about how we can get to the super AI. People are saying like 20, 30, 50 years from now. So it's long way in the future.

Karoun H. Bagamian: Got you. Yeah. And one of the things that it almost seemed like. It came out of nowhere, right? Although it's been there all along.

So I think about last fall, right? That ChatGPT exploded and there's this boom of awareness, but was it there? Did we, we were just missing it or was there some big innovation that happened that was able to spur this into a different direction?

Jesus Martinez Manso: Yes. So typically the advancements in AI and really in science and engineering didn't really happen at a linear pace always, or at even an exponential pace always, right?

They usually happened in phases and every phase can be a bit different. You can have exponentials and then plateau and then another exponential at some point and things like that. So I think something like that happened here overall in AI the last 20 years we've seen great advancements. And in the last five years, what's another, one of those exponential pieces of this journey.

ML and AI are fields that have existed for a long time, almost half a century. I think there are four key ingredients to the success of AI as we have it today. Around 30 years ago, We developed a new way to parameterize in functions so that it is much easier to fit very complicated functions to an objective.

And then a couple to that, some years later, we started getting a lot of machines, computers that can do a lot of operations, and also a lot of data with the internet, you know, and the new types of data storage. So the confluence of those three things enabled to fit these complicated functions to all this data very quickly.

And that happened about 10 years ago. That was the most modern renaissance of AI. And indeed there was an AI boom, the early 2010s or so you all heard about it then, but it didn't really hit as close as today with ChatGPT and all these tools. So the other thing that happened a bit later in around 2017 was that folks develop a new way, a new architecture of neural networks that was much more efficient.

For different nodes in the network to correlate with other parts of the network and other parts of the data. So essentially you could attend to a bunch of different data points in your data structure. In other words, a much higher connectivity, if you will, of the network. And that happened five years ago, around 2017, OpenAI and other tech firms started developing the models that a year ago or so were released into the public and that we all know today as Generative AI and so on. They are super famous.

Karoun H. Bagamian: Yeah, I have two questions about that. So you said a neural network. So does that mean it's based on a human brain or something about how nerves work? I'm just curious.

Jesus Martinez Manso: Yes, essentially that's right. It is modeled after a human brain. It's not an exact copy of the processes that happen in the human brain, but in a very simple view, it is, and the power of these kinds of networks

is how the information propagates through these neurons, these artificial neurons.

Because of these rules that we have of these neurons talking to each other, it is very easy to calculate gradients of a cost function with respect of those parameters. And the reason why this is important is because if you have a very complicated function, an arbitrary function, let's not talk about neural networks.

You have your mathematical function that has, let's say, a million parameters, and you want to fit those parameters to your task. If you do it in an arbitrary way, you need to evaluate the function, a lot of times, if you want to measure those gradients and if you have that many parameters, it is practically impossible to do.

Now with neural networks, the design is so smart that you can get those gradients basically in just one pass. So instead of having to do like a million evaluations of the function for your million parameters, you just do it a couple of times. And that allows us to train much faster and be able to leverage all the data that we have.

Yeah, it's just one pillar of the solution. You need the design of the network, the computing, and also the data to frame.

Karoun H. Bagamian: Yeah. And you mentioned this word that we hear these days, which is generative AI. And I believe Arash, that that's something that you actively do, correct? You are generating, sorry, you're generating generative AI, is that right?

Arash Maghsoudi: I'm going to start with the definition again. We can have two school of thoughts in machine learning and AI, one being discriminative and one being generative. You can ask a system to discriminate between an apple and an orange. You can show an image and say, which one is it? And you can tell if it's an apple or an orange, or you can ask it to draw the shape of an orange or an apple.

That would be the generative part of the AI. It generates data, synthetic data for you. Like ChatGPT does, it actually generates words.

Karoun H. Bagamian: Now that we know a little bit more about what AI is and where it came from, I'd like to talk a little bit more about how we're applying it. We started touching upon this with the ChatGPT and some discussion of tools.

But one thing that we do see a lot of are AI assistants. They seem to be popping up everywhere.

Seth Hughes: I mean, today, where we see AI is as an augmentation to people as an assistant, you know, very few applications are replacing people altogether. Where do you guys see it and where is it used in your day to day lives?

What is it augmenting for you now and where do you see that going? You know, in the next year.

Jesus Martinez Manso: Yeah, absolutely. I totally agree that right now tools like ChatGPT are definitely an augmentation by itself. It cannot do anything because it's kind of like, you know, this box, it can answer some questions, but you need a human to be interacted with it.

Right. So it's similar to Google search, which by the way, it's also an amazing AI tool. We think we've all been using amazing AI tools for the last 10 years.. We just didn't know about it all the time because it wasn't advertised to that. But, you know, Google search is also a very, very smart tool that gets you answers that match to, you know, an actual record in the internet. So I would put ChatGPT in the same bucket of augmentations as Google search in that you just ask some questions and then you go on with your day and you execute the tasks that you were meant to do as a human.

Now, I think there's another wave coming very soon. It's actually, it's starting to happen, which is the rise of agents, which is when you get something like ChatGPT, you give it some agency or autonomy in the sense that now it can search, it can interact with the, with the internet and it can take decisions by itself and then take another action. So it is still with the realm of the internet, so it's not going to, you know, do anything in the real world, but it can take action. So at that point, I think we may be able to start talking about replacement of certain jobs, because that will be a very similar interface as interacting with another human through the internet, right?

You may not even know who's who, which is a completely different problem that we might need to address as a society, but I do see that as the important moment in the near future, the rise of agents.

Lindsey Laytner: Pretty terrifying.

Karoun H. Bagamian: I think this leads, yeah, it's going to lead to an exciting, maybe.

So the burning question, what you just described Jesus is like, what is the future?

Are we close to being taken over by robots? Are humans going to be replaced?

Jesus Martinez Manso: Yeah. We just mentioned the rise of agents as one of the revolutions, mini revolutions, but the big one I think is going to come from robotics. So when we have things in the real world that interact just like us, that's farther down the line, but people are definitely working on it and making huge progress.

So that will be coming soon, but in some number of years.

Arash Maghsoudi: The answer to that question would be eventually, yes, but on what level. Are they, AI is doing to the menial jobs or is it going to, you know, replace other things like creating arts, or, I don't know, writing scripts, or directing movies, or things like that.

Could that happen in the future? I think that that would be an interesting question. And it really depends on your point of view on the philosophy of mind. Are you submitting to dualism or monism? In dualism, we think that there is a body and mind, there are two separate things. A mind. Or if you want to look at it in a religious aspect, it's like a soul that outlives you or things like that.

But in monism, which I think, I'm, like, 90 percent sure that it's true, it's that, yeah, we can actually simulate the brain. And we can come up with a mathematical model in the future that can explain consciousness, the process of decision making, creativity, reasoning, all things like that. And when we get to that stage, if we can have a mathematical model for these things, then we can implement them and have an AI that does these things.

So, yes, in the future, far, we can have robots that not only doing the menial jobs, they can create music and, I don't know, draw something, paintings, and maybe more pretty than humans. It depends. It's an art, so it's subjective. Everyone has its own, you know, perspective.

Karoun H. Bagamian: Yeah, well, I think that's a little scary, but it makes sense.

Why would that not be possible considering how much these tools have been able to do so far as we're touching upon here. So there's inherently going to be dangers and things to look out for in relation to AI or how we interact with AI.

Arash Maghsoudi: Sure. There are some dangers for narrow AI that we are facing right now, like deep fake or things like that where they can produce and create videos of you. I think those things can be addressed. I know it's complicated, but they can be addressed by regulation and laws and things like that. But when we get to the stage of general or super AI, it's gonna be more complicated. Imagine having AI that thinks better than us, and their interests might not actually align with us. So, that would be a conflict between humans and AI.

Or worse than that, if as a human we don't have a job, I don't know if you experienced it before, but I experienced it sometimes when I was out of jobs for like months, and it literally drove me crazy. If you don't have a job and you don't have anything to do It's going to be really hard for you.

People say that, okay, my job is like this and that, and they nag all the time. But they don't know if you don't have a job, what are we going to do with our time? I think that's worse than the things that we see in the movie, like Terminator or things like that, like Annihilation, things like that. Not having a job, for me, it's much, much worse.

Lindsey Laytner: I think that's a really interesting point because as humans, we need purpose, right? In our lives. So it's kind of like, how are we going to be defining our purpose 50 years from now? Where are we in the landscape amongst these machines that may be way more intelligent than we are.

It's also kind of scary because I think about, you know, there's some not so great people in the world. And what are they going to do with some of this technology? What would that mean for us as civilization, for our planet? I see a lot of possibilities for things to improve. Especially in medicine, I'm just thinking about some of the robotics that perform surgeries, right?

We have that already and that's helping so much. You know, I think about like radiology and you know, going through all of those scans, I can instantaneously find things that humans wouldn't be able to find. It's exciting and it's scary and I don't know.

Karoun H. Bagamian: Yeah, I think a lot of us feel that way.

Seth Hughes: One of the things that I don't have the answer for, but, you know, definitely keeps me up at night.

And, you know, we touched on that fear, the self aware superintelligence, Skynet, and the hubris of humanity, but I mean, we're in that chase right now, right? Everyone is racing to get there first, and there isn't a lot of thought being put into the what if consequences right now. And I agree, we're a ways away from that danger, but when do you put the brakes on, you know? And in the context of a capitalist society that, that we are, that brings up a lot of questions too, because you look back at the industrial revolution, you know, he who owned the machine was the one who was doing well. It was the standard worker that got stomped out.

And it seems that that's potentially where we're headed now. He who owns the AI may be controlling everything. Are we going to get to that utopian place where AI is making everybody happy or, you know, is it a monster conglomeration that owns all the AI and we're subordinate to them? I don't know that any of us have the answers, but I'd be curious what you guys think about how we get there.

Because right now it seems like the chase is just to get there first, not, you know, how to get there or what those consequences might be.

Karoun H. Bagamian: That was a good question.

Lindsey Laytner: Yeah, that was a great question. Well said. I was also thinking, like, to ask you guys what your thoughts are regarding what should we be doing as a society right now?

You know, we, we know that we're on the brink of something that could be incredible in a variety of different ways, whether it be negative, positive, whatever. What do we need to be thinking about? What do we need to be doing now to make sure that we are protecting ourselves and also maintaining our purpose?

That we as humans don't go insane and disappear..

Karoun H. Bagamian: Arash, what you had brought up about not having anything to do, that really resonates with me because I think I've thought about that, you know, first of all, I'm a writer, ChatGPT, you know, being able to write and do some of the things that I can do quickly. And even though it's not doing it correctly now, eventually it probably will, it really bothered me.

And one of the things is because it's doing the process that I enjoyed doing. You know, synthesizing things in my brain. Of course, I still see the advantage of using these tools, but it's something that I've thought about a lot myself.

Lindsey Laytner: I can also totally relate to that.

Arash Maghsoudi: One solution would be like the movie Dune. I don't know if you've seen that one. So at a certain point they abolished any AI. So in the future, there's no AI in their society. That could be one solution to that. But it's not really good to end up like those people in the WALL E.

Heidi Bolduc: Yeah. We don't want to do that.

Lindsey Laytner: It's not really realistic.

Karoun H. Bagamian: It's better than Terminator. I don't know if it's better or worse than Terminator, but they're both, you know. Interesting parts of the spectrum,

Arash Maghsoudi: but these are the things that we have to think about before we get there.

Lindsey Laytner: Yeah. I'm also curious what everyone's perspective in terms of what does this mean for critical thinking and brain Cognitive development cognition what have you because I think about some of these like degenerative disorders and some of the ways to prevent it is keep yourself busy, keep yourself engaged -- learning. Building those neural networks. And so if we're going to have machines, kind of, doing all these things for us, where do we continue to develop creatively? That's something that I keep thinking about, because I have also been unemployed before, and it is not fun, and it is something that, you know, definitely drove me crazy.

After a week I was like, woo. And then I'm like, no, this is not okay. . I can't, you know, there's only so many books, puzzles, everything that you can do before you just wanna bang your head against a wall and say, give me something challenging and something that I can be creative with. So, yeah, I'm just really curious what your collective thoughts are with regard to that.

Arash Maghsoudi: I think something similar to that happened before, you know, we used to have these notebooks with everybody's telephone number in them. But nowadays I cannot, sometimes I cannot remember my own number.

Yeah! By the advent of calculator, people got worse at math. These things always happening, yeah, so. That's inevitable, I think.

Seth Hughes: Yeah, what's going to happen to the current generation of teenagers that are writing all of their term papers with ChatGPT now, you know, and not really learning these skills that are kind of the building blocks of most occupations.

Heidi Bolduc: Yeah, as an adjunct professor, that's actually what I worry about the most.

Is just students not getting what they need because they're using a lot of these shortcuts and not really having to think critically when they're writing a paper,

Seth Hughes: right? Right? Like, when I think back to school for me, obviously before this as well, but even with the scientific calculators, you still had to learn how to do the math manually, before you would move on to a computer or a calculator doing it for you, you needed to understand what the background process was before you automated it and you know, had a machine do it for you. I wonder if that's slipping away more than it has before.

The other side of that argument, this has always been happening, like Arash was saying, like there's always new technologies coming in and disruption. Particularly the kids and the teenagers are the ones that tend to pick it up the quickest. So maybe they're actually getting more poised than everyone else to leverage what comes next, but. Yep, it's all a lot of unknown and concern.

Lindsey Laytner: Yeah, I mean, kind of on that same note though, I just keep thinking about students and thinking back of when, you know, I was in high school and you know, you're right, Seth, we had to learn everything by hand first, and then you were allowed to have the calculator.

So you still kind of got that foundation. And I know I'm not speaking probably for all students, and I know this isn't a podcast about what's happening with the education system in America or across the world, but I know that there's a lot of high school students right now and even middle school students that have classes online, which was never a thing.

And, you know, I just wonder so much, like, with all the AI and the fact that people aren't sitting in a classroom, they're not being watched, they're not kind of being forced to engage right then and there without these tools, what that's going to look like, because I know the landscape's just changing all across the

board, and I guess we're all just going to have to adapt and hope for the best, hope that mankind is extremely adaptable and will Become even more intelligent, and I don't know.

Arash Maghsoudi: I think it is.

Jesus Martinez Manso: I think it is. But it's not infinitely, I mean, it takes a bit of time, right? So this is just happening, so I think we need maybe some years, maybe a couple decades to really settle in the new reality. But, yeah, the new reality is going to be very different. In a world where The cost of intelligence is basically zero, meaning that everyone can have all the intelligence of the world at any time applied to them, to their personal benefit.

That completely changes everything. And in terms of education, I think that we are probably not going to have classrooms. We're not going to have people jointly go somewhere to listen to someone to learn about something, but you probably have your own assistant. So you do the actual direct learning and maybe we need another social component to discuss ideas with others and things like that.

I suspect that education is going to look a lot different, but it doesn't mean that we will dispose of humans completely. We just need to rearrange what is the best thing we can get from humans and the best thing we can get from AIs.

Karoun H. Bagamian: Yeah, that's a good question because, I mean, if this comes to something that was brought up in conversation, like regulation or putting controls, will it help initially?

And then that's going to evolve over time. Will it even be able to keep it? And one of the things that Seth was pointing out in a capitalist society. Things are always geared towards getting to some goal faster and better and stronger. And, you know, the ultimate goal of capital society is more money. Are we going to be able to regulate it?

Whose responsibility is that going to be?

Arash Maghsoudi: Yeah, as Jesus mentioned, I think the problem is when it gets exponential, when it gets out of hand. So I think these regulations can help us to somehow decelerate these advances and give us time to actually adapt ourselves and find new ways to stop that bad things from happening.

Jesus Martinez Manso: However, I would say that that works for the regulation that applies within a country. So for all people in that country, but not across countries. And I see that as the major threat for efficiency of regulation. You can regulate all you want in the U. S. and Europe, but what are countries going to do? So, I think that the cat is kind of out of the bag, you know, it's true that today, probably the U. S. is the only country that can train really, really powerful AIs, not mainly because of the people here, but just because of the control of the chips, right? Which this entire kind of economic war around that, but that's kind of temporary, you know, I think it is very hard to get the entire world to agree.

Very few instances in history has the world been able to agree on anything like this. Maybe nuclear proliferation is one of them. We didn't really nuke each other, but people still have the nukes and who knows what countries have promised to do but didn't do in the end. So nukes is a much simpler thing that we understand much better and the consequences we understand, you know, how to use it and so on.

In the case of AI, it's really, nobody knows, right? So it could be terrible. It could be good. Everyone is really empowered to go as fast as they can without breaks. I just think that because of all these considerations, it's very hard to stop or control.

Karoun H. Bagamian: Gotcha. One thing I'd like to point out, when they were developing the nuclear bomb, they didn't realize how devastating it was going to be either.

Now we know, but they had to do it first. I think they had like an inkling, but they didn't realize the magnitude until they actually did it. So, but that was what I was thinking when you guys were talking about this, so that it sounds like a global weapons race or. Things like that, where it's hard to control all the parties that are involved.

Sometimes the world has come together, as we've said, and regulated or tried to, you know, put some more rules, but it's true that certain countries might have different priorities and might not follow those. So it'd be harder to enforce that globally.

Seth Hughes: Particularly when, when this is like directly applicable to profit, right?

To economic gain right now. Yeah. Are you going to be able to have Russia or China, you know, agree to something? When we're already behind the scenes in a race for economic supremacy. So it's, yeah, it's a, it's a tough question.

Lindsey Laytner: I mean, I think that that's also one of the reasons why it can be really scary to a lot of people that don't necessarily understand AI.

I can raise my hand and say that I'm victim of falling into this as well, where you start to like, listen to all these other people that are talking about, oh, AI is going to take over and it's going to take over our military. And, you know. we'll be able to like annihilate whole races off of the face of the earth and all of this crazy stuff.

I was listening to one podcast and he was interviewing a gentleman who I'm forgetting his name, but he essentially said if you're thinking about having a child right now, don't. It's not worth it because you don't know what's gonna happen and you know, our world could basically be wiped to smithereens and it definitely like kept me up at night.

If this is the case, if we're really that crazy.... I mean, I, I like to believe that humanity is good, right? We have a lot of good people. We wouldn't let, you know, people that aren't so good do things like that. But yeah, I guess I'm echoing the fears of like the layman.

Karoun H. Bagamian: But I think one of the things that Arash and Jesus mentioned, or we mentioned before is also that these kinds of things have happened before.

And the person that you're describing said that there was someone like that saying it about something else in the past, you know, like climate change. A lot of people are like. Yeah, don't have kids because of climate change or there's no future or something like that, but somehow we're adjusting. Granted, we are still destroying the environment, but we figure out ways to try to adjust. So hopefully we can figure out ways to

Lindsey Laytner: Let's use AI to help us solve that problem.

Karoun H. Bagamian: Yeah, if we're good and, you know, you were talking about this, Lindsey, earlier besides. You know, a lot of other advances, there's been a lot of medical advances where some of these newer tools are improving diagnoses of hard to detect conditions and things like that, which seems really promising.

Using data informed models just has changed a lot of that and then mixing that with AI.

Lindsey Laytner: I have a question for Arash about AI and Medicine. Are you using it at all with EHR data or do you see like a future with using EHR data to be able to identify high risk patients for certain conditions, things like that?

Arash Maghsoudi: Yeah, exactly. That's the thing I'm doing right now. I'm using AI to extract information from EHR and to actually do diagnosis. We're pretty good at diagnosis right now. We can diagnose many things from images and notes, and we are moving to treatment and planning and things like that. And in the near future, we can do things like that, like personal treatment for each patient.

That would be ideal, right? Right. And like interpreting images, so many images that could be really good for retrospective studies or things like that.

Karoun H. Bagamian: And EHRs are electronic health records. Is that right? That's what you guys are talking about?

Lindsey Laytner: Correct.

Karoun H. Bagamian: Yeah, that's what I thought...

Lindsey Laytner: So much data out there. Yeah, I know. There's so many issues with EHR, and I'm sure Arash can go on more than I can about that.

But we have so much, and it would be great to be able to use it for really positive purposes. And yeah, I think Being able to identify people that are at risk of certain things and be able to catch diseases early would be so cool and so needed. And

Seth Hughes: in the name of coordinated care, which has been a problem, I was in the healthcare space with writing and programming EHRs, and that's been a gap for a long time, particularly for people that have kind of real immediate acute problems.

And you've got, you know, 4 or 5 different specialists that you're seeing all the time. That care coordination was always a problem. Communication between the two, catching problems or knowing how to actually implement treatment plans across all specialties. I mean, AI is going to be huge for that, to be able to

kind of holistically look at everything going on and hopefully, you know, catch those gaps before they happen.

Karoun H. Bagamian: It's true. There's a lot of miscommunications and probably not just in medicine and other things that can be improved. Just because they're able to coordinate better or have better tools like that.

Lindsey Laytner: Probably also help with data sharing too to be able to connect different groups of data together that we have difficulty merging or what have you.

I'm thinking about in the concept of the HR because I know that each hospital has their own and they don't communicate with one another and there's all this data, all this information and you live somewhere and you have gotten treatment and let's say you move somewhere else and you kind of start over with a different doctor.

They're not really sharing unless you're doing a lot of the dirty work yourself to bring all that information to the physician. And even still, it's too much for them to do. I mean, they're just so overburdened. I do see AI as being a great way to help the US healthcare system and improve so many things as well as hopefully help with climate change and our world.

Like, come on, we need it. We can't wait 50 years. It's got to happen now.

Jesus Martinez Manso: One interesting thing is that for a lot of these things, the tech is already here. So we already have the technology, the data, the algorithms to do a lot of these narrow AI tasks. What takes longer is adoption and implementation. So just us humans, you know, realizing that it exists, then getting it in place and whatever working program we have.

And also regulations, which obviously in the healthcare space, there's lots of them. Even when the technology exists, it might take several years until we actually see. These things deployed in a way that can be used mainstream.

Karoun H. Bagamian: So we've talked a lot about AI and where it's at and where it's going. One of the most important things in my mind is where should we position ourselves so that we're not left behind? Do you guys have any suggestions for that?

Jesus Martinez Manso: I would make perhaps two distinctions. One of them is How will we as a society be left behind by AI?

And if so, what can we do? And then another one, how can we ourselves as individuals not be left behind society that's trying to catch up? I think those are two different questions that the first one we kind of talked about it earlier, you know, it's more like existential. Yeah, the second, I think the answer is that it's probably fine.

So when you're part of, you know, a population that where everybody's freaking out, nobody really knows what to do, you're probably going to be fine. So you just want to be like, just a little bit more informed than the median person, perhaps. But you know, there's nothing dramatic that you need to do right now.

You're probably going to be okay.

Karoun H. Bagamian: All right. How about people that their fields are going to be revolutionized by that?

Jesus Martinez Manso: Yeah, I think anyone should use whatever tools they have at their disposal that are going to enable them to do a better job generally now and before. I think that's always been the case..

Karoun H. Bagamian: Yeah, it's not different than anything else.

Just try to make sure that you're staying current with everything that's going on. And do your best to learn what the standard is in your job or your industry.

Jesus Martinez Manso: Right. And perhaps just think a little bit ahead. So you see all this technology and say, Hey, in three years, do you think that we will be using this more or less, or is there any new tech that you think is going to be more mainstream in three years?

And if so, then you probably want to learn a little bit more about it.

Seth Hughes: I think this is again, I go back to the industrial revolution, you know, where people were being replaced by machines. The people who understood the machines and repaired the machines were always needed. Right? So it's the same thing here.

You know, understanding the technology, understanding how to apply it. Or even being, you know, one of the people building it, that's how you stay positioned. You know, keep your friends closer, your enemies closer. If you don't know what's going on, you're more prone to be left behind. So yeah, it's

going to be an ongoing daily, weekly, monthly battle just to stay apprised of the latest, understand it.

Lindsey Laytner: I think those are great points. I think. People need to really understand what AI is and how it's going to work in their field, or how they can use it, and try to not be close minded to it, because it is something that we're going to, we have been using, and I think it's just, again, it's just a fear thing, it's like, people don't realize we didn't have computers, what like, 30 years ago, maybe.

I might be wrong. Now we have computers. We use them every single day for every single thing, at least I do. And I mean, it's a tool, right? And it's an intelligent tool that we're utilizing. So we can't be afraid of it. We just have to learn how to incorporate it and make it work for us.

Arash Maghsoudi: I want to add one final thing. I know that the discussion got dark in some parts, but I think that's.

Lindsey Laytner: Sorry,

Arash Maghsoudi: I did that too,

Jesus Martinez Manso: you guys started it.

Arash Maghsoudi: As a human race, we cannot figure out solutions to these.

Karoun H. Bagamian: Thank you. Thank you for saying that because I, that's on a happy note. Yeah, I agree. I agree. Thank you so much for joining us today and having this discussion. All of you, especially Jesus and Arash, and then, of course, the rest of the Bagamian Sci team.

We really appreciate having this discussion.

Lindsey Laytner: Agreed. Thank you guys so much. This was really fun. It was awesome.

Jesus Martinez Manso: And try to use AI for your editing process.

Karoun H. Bagamian: Thank you for joining us and listening to the Business of Doing Science podcast. For more information on our guests and access to career development resources, please click on the link to our website below.

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